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# China Report

SCIENCE AND TECHNOLOGY

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10 December 1984

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## NATIONAL DEVELOPMENTS

### ZHANG JINGFU STRESSES TECHNICAL PROGRESS

OW210117 Beijing XINHUA Domestic Service in Chinese 1438 GMT 20 Nov 84

[Text] Beijing, 20 Nov (XINHUA)--At the closing session of the second national work conference on enterprise technical progress today, a number of advanced units were given awards and commended for making remarkable achievements in technical transformation and development.

Of those advanced units, 66 enterprises made remarkable achievements in transforming themselves with imported technologies, 74 achieved remarkable success in certain stage of their transformation with imported technologies, and 154 other units made important contributions to 110 successful technical development projects.

With the upgrading of products as their objective, those advanced units undertake technical development, import of technology, technical management, and technical transformation in an coordinated way. They have achieved quick and good economic results in increasing production with little investment, and have thus made great contributions to socialist economic construction.

Zhang Jingfu, a state councillor, attended and addressed the meeting.

Zhang Jingfu said: In recent years, especially since the beginning of this year, China has taken a bigger stride in technical progress and has gained some experience and achieved certain success. However, our planning work for various professions and trades, making preparations for technical progress projects, and digesting imported technologies is still insufficient. We should continue to work hard.

Zhang Jingfu said: The leading comrades of the Central Committee and the State Council have repeatedly pointed out that economic development must rely on scientific and technological progress. This is a basic guidance for our economic construction henceforth.

While our country's financial and material resources are not yet plentiful, the localities and departments undertaking technical progress projects must spend their limited funds truly on technical progress. From now on, the

technical transformation of enterprises should primarily rely on their own funds and bank loans. In order to improve economic results, the enterprises must learn how to use bank loans, and establish the concept of capital turnover, interest, and input and output. All work for technical progress must be aimed at improving economic results.

Zhang Jingfu pointed out: The financial and economic departments at all levels should serve production and the technical progress of enterprises. First, they should delegate the power of making microscopic decisions to lower levels, and at the same time, further strengthen macroscopic management. Second, all economic departments should firmly improve their working style, simplify administrative procedures, and raise working efficiency.

Du Xingyuan, Lu Dong, Yuan Baohua, Wang Lei, and the responsible comrades of the Ministry of Finance and the People's Bank attended the meeting.

CSO: 4008/131

## NATIONAL DEVELOPMENTS

### EXCHANGE OF SCIENTIFIC SERVICES PROMOTES GROWTH

OW151215 Beijing XINHUA in English 1142 GMT 15 Nov 84

[Text] Beijing, 15 Nov (XINHUA)--The establishment of a national network to coordinate scientific and technical services among large and medium-sized cities, has promoted scientific and economic development, according to a national work conference being held here.

Up to now, the conference disclosed, 146 scientific and technical development and exchange centers in these cities have joined the network.

Last September, five provinces and autonomous regions in northwest China asked the national network to help them in 2,000 projects, and responses have come from 44 universities and colleges, 55 scientific institutes, and 40 national defense research institutes of the People's Liberation Army. They have provided suggestions for the development of these areas.

Dozens of meetings have been held to exchange scientific and technical experience and provide technical services in Beijing, Wuhan, Shenyang, Dalian, Chongqing, Hangzhou, Xi'an and Chengdu since 1981. Some 5,300 technical coordination contracts and transfer of technical know-how have been signed, and the volume of business reached 130 million yuan (50 million U.S. dollars).

The eight cities have also established 123 economic associations of various descriptions, and have held training courses attended by 42,000 people.

In order to enable people to give full scope to their initiative and ability, Shanghai has set up an "experts bank" which sends experts to clients to provide technical services.

CSO: 4010/26



## NATIONAL DEVELOPMENTS

### SCIENCE, TECHNOLOGY REVIEW SOCIETY SET UP

OW162010 Beijing XINHUA in English 1434 GMT 16 Nov 84

[Text] Beijing, 16 Nov (XINHUA)--The China Science and Technology Review Society was set up here today.

It will publish a journal SCIENCE AND TECHNOLOGY REVIEW with the Science and Technology Publisher Inc of the United States, to be issued both at home and abroad.

The society will promote scientific exchanges between China and other countries and report on advanced foreign technology, scientific research results, academic works and outstanding scientists and scholars and foreign economic and scientific management. It will also increase contacts with foreign scientific organizations and individuals as well as those in Taiwan and Hong Kong.

Society president Liu Da, who is honorary president of Qinghua University, said the society would make suggestions on the formulation of national scientific and technological policies and on economic reform, and provide information on science and technology, the economy and commodities and the import of advanced foreign technology, equipment and products.

On the society's committee are noted scientists and scholars such as president of the Chinese Academy of Social Sciences Ma Hong, and Professor Qian Weichang, president of the Shanghai Engineering Institute.

CSO: 4010/26

## NATIONAL DEVELOPMENTS

### COASTAL CITIES' CHEMICAL PLANT PLANS ANNOUNCED

OW171211 Beijing XINHUA in English 1134 GMT 17 Nov 84

[Text] Beijing, 17 Nov (XINHUA)--China will start building more than 500 chemical works in coastal cities and special economic zones in the next five years. Lin Yincui, vice-minister of the chemical industry, told a meeting here that most equipment and designs for the projects would be imported and negotiations were already underway.

Existing enterprises in these areas could raise foreign loans and cooperate with overseas interests in a variety of ways in constructing these projects, he said. Foreign firms would also be allowed to build chemical works here, he added.

There are now more than 800 chemical works in the 14 coastal cities, four special economic zones and Hainan Island which have been designated by the government for opening further to the outside world. Their combined output last year reached over 13 billion yuan, 31 percent of the national total.

Delegates from Shanghai said the city would give priority to high polymer chemistry, fine chemical and bioengineering. It would also use foreign funds, technology and equipment to upgrade its 123 existing plants. Tianjin would stress salt chemicals, fine chemicals and high-grade dyes and paints, delegates from this north China industrial center said.

Participants from Guangzhou reported that it would invest one billion yuan in the next five years in technology and equipment for building or upgrading 25 chemical works. It would also increase production of basic chemicals such as caustic soda, hydrochloric acid, and fine chemicals including adhesives and food additives.

Qiangdao would increase its production of tires, high-strength transmission belts and rubber-sole shoes while turning out more paints, dyes and silica gel.

Zhanjiang in Guangdong Province planned to expand its rubber refining industry, turn out more essence and perfumes and develop plastics with petroleum from the South China Sea. The natural gas and rubber resources in Hainan Island would be fully utilized to produce more chemical fertilizers and emulsive products.

## NATIONAL DEVELOPMENTS

### SCIENTIFIC-TECHNOLOGICAL WORK MEETING CLOSES

OW191231 Beijing XINHUA Domestic Service in Chinese 1213 GMT 17 Nov 84

[By reporter Meng Xiangjie]

[Text] Beijing, 17 Nov (XINHUA)--At today's closing ceremony of the national work meeting on the development of science and technology and the exchange of specialized personnel, Yang Jun, vice minister in charge of the State Science and Technology Commission, said that scientific and technological achievements should be commercialized and that it is necessary to open the market for these achievements.

After fully affirming the achievements made in recent years in the development of science and technology and the exchange of specialized personnel, Comrade Yang Jun pointed out that reform of the scientific and technological system should focus on the commercialization of scientific and technological achievements, and that it is necessary to open the market for the transaction of these achievements. He considered this an important link in ensuring good development of science and technology, and a smooth exchange of specialized personnel.

Comrade Yang Jun said: The key issues in reform of the scientific and technological system are: 1) How to have science and technology serve economic construction, and how to promote the application of scientific and technological achievements in the economic field and the society, thus enabling these achievements to produce economic results and benefit the society; 2) How to recruit people with potential and bring their potentialities into full play. He said scientific and technological development should be closely integrated with the exchange of specialized personnel.

Yang Jun said: All provinces, autonomous regions, municipalities, and key cities may set up markets for the exchange of scientific and technological achievements, either permanent or trade-fair markets. The value of scientific and technological achievements should be determined in the course of their exchange and circulation.

On the direction of the future work on the development of science and technology and the exchange of specialized personnel, Yang Jun hoped that the

science and technology commissions of all localities would regard the establishment of science and technology markets as an important element of their efforts to reform the economic structure. He also hoped the localities would pay close attention to it and ensure its success.

CSO: 4008/131

## NATIONAL DEVELOPMENTS

### BRIEFS

PAID TECHNOLOGY TRANSFER ENCOURAGED--Beijing, 19 Nov (XINHUA)--China is encouraging paid transfer of technologies and results of scientific research, and markets for selling such items will be opened. Addressing a national conference ending here last Saturday, Yang Jun, vice-minister of the State Science and Technology Commission, described results of scientific research as valuable commodities which would quickly turn into productivity. He called on all provinces, municipalities, autonomous regions and large cities to establish permanent markets for technologies and research results or fairs to exchange them. Shanghai's Scientific and Technical Development Center, founded in May 1983, has arranged eight such fairs with a total attendance of 400,000 people. Some 800 agreements were signed by scientific research institutes with local factories and other enterprises for the dissemination and transfer of research results and technologies worth over 20 million yuan. [Text] [Beijing XINHUA in English 1156 GMT 19 Nov 84 OW]

BEIJING COMPUTER TECHNOLOGY COMPANY--Beijing, 18 Nov (XINHUA)--A newly established computer technology company has just opened for business here. The Syntone Advanced Computer Technology Co, Ltd was jointly run by the Computing Technology Institute under the Chinese Academy of Sciences and the Haidian New Technology Development Company. The company engages in developing computer and information technology, introducing foreign advanced technology, and organizing scientists to tackle key technological problems. It contracts to develop computer hard- and soft-ware. The Syntone Company has business contacts with various research institutions of the academy. [Text] [Beijing XINHUA in English 0810 GMT 18 Nov 84 OW]

CSO: 4010/27

LI PENG STRESSES ENVIRONMENTAL PROTECTION

OW200958 Beijing XINHUA Domestic Service in Chinese 1540 GMT 19 Nov 84

[By reporter Ge Daxing]

[Text] Beijing, 19 Nov (XINHUA)--Speaking at the second meeting of the State Council's Environmental Protection Commission, Vice Premier Li Peng said: At the end of this year, all provincial governors, chairmen of autonomous regions and mayors of municipalities should hold news briefings or use other means to report to the people on what the government has done to protect the environment in the past year. They should encourage the masses to inspect and supervise environmental protection work.

Li Peng said: Protecting the environment is China's established policy. This point should be repeatedly stressed. The stipulations of the "three simultaneous efforts" [environmental protection measures and principle parts of a project simultaneously designed, constructed, and put into operation] and the principle of "whoever creates pollution should clean it up" have not been strictly observed in some localities. From now on it is necessary to adopt effective and concrete measures to exercise better control over this work. Now that the self-decision power has been expanded, enterprises have more funds at their disposal and have much to do in environmental protection. We should not only go after increased output and bonuses and overlook pollution control. It is necessary to strengthen environmental control and rely on the strict enforcement of the law and on preparing public opinion to make the enterprises pay attention to environmental protection.

Le Peng stressed that in the future, while making efforts to control pollution in the cities, special attention should be paid to controlling pollution in villages and towns. It is necessary to give warm support to flourishing village and town enterprises, but they should also be properly guided. Small enterprises of villages and towns should no longer be allowed to pollute major rivers.

State Councillor Song Ping attended and addressed the meeting.

At today's meeting, responsible persons of Harbin and Luoyang cities reported their achievements in preventing and controlling industrial pollution and reducing traffic noise. The participants praised the experience of the two

cities, whose mayors have taken personal interest in environmental protection; heeded public opinion on environmental protection work; exercised strict control; and acted in accordance with the law. The meeting also heard a report by a responsible comrade concerned of the State Council's Environmental Protection Commission regarding progress made by China in environmental protection. It studied the question of protecting the quality of water diverted into Tianjin from the Luanhe and promulgated the "Tentative Measures on the Criteria for Assessing the Industrial Enterprises in Terms of Environmental Protection."

The meeting also decided that Rui Xingwen, minister of urban and rural construction and environmental protection, will head the leading group for protecting the resources of the water diverted from the Luanhe, which will seek a fundamental solution, within a year, to the problem of polluted water diverted to Tianjin from the Luanhe.

CSO: 4008/130

## APPLIED SCIENCES

### RENMIN RIBAO URGES END TO OUTER SPACE POLLUTION

HK170844 Beijing RENMIN RIBAO in Chinese 13 Nov 84 p 7

["Jottings" by Tan Feng [6151 6912]: "The Heavens and the World of Mortals"]

[Text] The vast heavens are studded with twinkling stars. Over millennia mankind has paid a high price in order to explore this wonderful unknown world.

Eventually, mankind has been able to fly into outer space since the mid-20th century. Unfortunately, however, because people fail to act according to law of nature, they have now turned outer space into a colossal "garbage dump" following the pollution of seas, land, and the air. Some experts have pointed out with great anxiety: "Today a ring formed by fragments is encircling the earth. This includes scrapped manmade satellites, gears dropped by spacecraft, and innumerable metal fragments left in space after explosions." Moreover, fragments in countless numbers have been falling from the sky, and this is seriously threatening people living on earth. One report pointed out: Since 1957, "more than 9,000 manmade objects have fallen from their space orbits."

Leaving aside the pollution problems on earth, we find that the "fragment pollution" in outer space alone is now seriously threatening mankind's peaceful development and utilization of space and its prospects for bringing benefit to mankind. Most of the space fragments are left by the two superpowers in their contention for space dominance. Some analysts have pointed out that the Soviet Union has all along been engaged in tests of "intercepting spacecraft and causing a collision of target satellites" in order to develop effective "antisatellite weapons;" while the United States is also perfecting its antisatellite weapons system, and put forward its more startling "star war" strategic plan not long ago. People in the world are calling out loudly: It has become more and more urgent to sign an international agreement on banning all intended explosions in outer space.

The unrest in the heavens has its roots in the unrest in the world of mortals. The contention for hegemony between the superpowers has extended from the earth to outer space and has caused unrest both in the heavens and on earth. Xun Zi, an ancient Chinese materialist thinker, said in his book "On Heaven":



"Among all existing things, the most terrifying are artificial anomalies." Here, "artificial anomalies" refer to all kinds of manmade disasters, which are indeed dreadful. Protecting outer space from being polluted is not only a technical issue, but is, first of all, a political issue. Only when the superpowers stop all arms races and activities for contending for hegemony on earth and in space can real tranquility and peace emerge in the world between heaven and earth on which mankind relies to maintain its existence.

CSO: 4008/130

## APPLIED SCIENCES

### NUCLEAR POWER SOCIETY ESTABLISHED

Changdu HE DONGLI GONGCHENG [NUCLEAR POWER ENGINEERING] in Chinese Vol 5, No 4, Aug 84, Inside front cover

[Text] The Nuclear Power Society of the Chinese Nuclear Society was established in Beijing on 16 April 1984 and China's nuclear energy workers celebrated the event. The 52 representatives attending the establishment ceremony came from the Ministry of Nuclear Industry, the Ministry of Water Resources and Electric Power, the Ministries of Machine Building, and universities and colleges.

Comrade Jiang Shengjie [1203 5110 7132], Director of the Chinese Nuclear Society, spoke at the meeting and stressed the necessity of developing China's nuclear energy and the importance of establishing the Nuclear Power Society. He urged the Society to work with workers in other fields and contribute to the development of China's nuclear and power industry. Comrade Jiang also announced the appointment of the Director and Secretary of the Society.

Representatives to the meeting affirmed the policy of the Party Central Committee to develop hydropower and thermal power simultaneously to stimulate the development of nuclear energy and promote the growth of the power industry. Today's situation for nuclear power development is excellent, the Qinshan nuclear power station has begun construction and the Guangdong nuclear power station has also broken ground on 2 April. These are results of the correct policy of the State Council and the efforts of the associated departments. The meeting participants also made constructive suggestions for future work and for the establishment of specialty task groups. It is believed that the Society should study the policy for nuclear power development, investigate the technological development in nuclear power and make recommendations to the state. The Society should also publish the journal "Nuclear Power Engineering" to promote exchange with sister societies in China and strengthen international academic exchanges.

The establishment meeting was chaired by the standing Deputy Director Comrade Zeng, who reported on the preparation and organizing of the Society. Comrade Lu Guangji [0712 1684 5030], the Secretary, read the names of the Directors of the Society. The Standing Board of Directors held two meetings and discussed the establishment of five task groups (the secretary group, the academic group, the consulting group, the safety regulation group and the

journal editorial department) and 12 professional task groups including reactor physics, reactor thermodynamics and hydraulic and nuclear power safety. An editorial board was established for the journal "Nuclear Power Engineering". It was also decided that the first annual meeting will be held in the first half of 1985 to discuss the direction of nuclear power development, to explore the policy for China's nuclear power development and to invite the participation of sister societies.

9698

CSO: 4008/40

CHARACTERISTICS OF FISSION PRODUCTS IN FAST REACTOR

Chengdu HE DONGLI GONGCHENG [NUCLEAR POWER ENGINEERING] in Chinese Vol 5, No 4  
Aug 84 pp 61-65

[Article by Zhou Zhennian [0719 2182 1628] and Zhan Jingxian [6124 7234 1288]]

[Text] Abstract

This paper discusses the characteristics of fission products in a fast reactor and identifies the important fission products in a fast reactor. The results will help the analysis of the characteristics of a fast reactor.

I Introduction

As is well known, the fission products in a thermal neutron reactor have important effects on the physical parameters of the reactor. The poisoning, iodine pit and xenon oscillation phenomena in a thermal reactor are all related to the generation and dissipation of the fission products in the fission process of the fuel. In the thermal zone, extensive studies have been made on the measurement of the cross section and yield of the fission products and on their effects on the physical parameters of the core, the role of the fission products in a thermal neutron reactor is thus clear. In the fast energy zone, the fission products play a minor role with respect to the reactor core parameters of a fast neutron reactor because of the small cross sections. On the other hand, since the measurement of the fission product cross section is more complicated for a fast reactor, cross section data and yield data remained incomplete for a long period of time. Therefore, in the design of the earlier fast reactors, the static and dynamic parameter calculations were made for the net reactor system (i.e., without fission products in the core). In recent years, along with the accumulation of cross section and yield data of fission products in the fast energy zone, it has become possible to study some of the characteristics of the fission products in a fast reactor. In this study, we began with the collection of cross section, yield and half-life data and then calculated the FP process<sup>1</sup> for a high concentration uranium oxide fast reactor and obtained some burnup characteristics of the fission products in a fast reactor.

## II Calculation Method

Like a thermal neutron reactor, a fast reactor produces hundreds of fission products in the fission process and these products have different effects on the reactor core. From a reactor physics standpoint, a fission product is more important if the product of the concentration  $N_i$  and the microscopic cross section  $\sigma_{ci}$  is large. We now know that in the fast energy zone there are no fission products with especially large cross sections like the  $^{135}\text{Xe}$  and  $^{149}\text{Sm}$  in a thermal neutron reactor. To assess the importance of the fission products, we use  $X_i$  to represent the importance of the  $i$ th fission product at a given time of the burnup process:

$$X_i = \frac{N_i \cdot \sigma_{ci}}{\sum_{i=1}^m N_i \sigma_{ci}}$$

where  $N_i$  is the concentration of the  $i$ th fission product at a given time,  $\sigma_{ci}$  is the microscopic cross section of the  $i$ th product and  $m$  is the total number of fission products. In the burnup process the concentration  $N_i$  varies with time and so does  $X_i$ .

Using a four-group point-burnup fission product FP process, we calculated the concentration of 164 fission products (see Table 1) and the macroscopic cross section  $\sum c_i$ . The half-lives of the 164 fission products are all greater than several hours and are therefore significant in the fast reactor burnup calculation. We used the cumulative yield of the fission products first appeared on the chain and effectively included the effects of some short-lived fission products.

Table 1. 164 fission products

No.	Fission products	No.	Fission products
1	$^{72}\text{Zn}$ ;	22	$^{123}\text{Sn}$ ; $^{125}\text{Sn}$ ;
2	$^{72}\text{Ga}$ ;	23	$^{121}\text{Sb}$ ; $^{122}\text{Sb}$ ; $^{123}\text{Sb}$ ; $^{124}\text{Sb}$ ; $^{125}\text{Sb}$ ; $^{127}\text{Sb}$ ;
3	$^{72}\text{Ge}$ ; $^{73}\text{Ge}$ ; $^{74}\text{Ge}$ ; $^{76}\text{Ge}$ ;	24	$^{122}\text{Te}$ ; $^{124}\text{Te}$ ; $^{125}\text{Te}$ ; $^{126}\text{Te}$ ; $^{127m}\text{Te}$ ; $^{128}\text{Te}$ ; $^{129}\text{Te}$ ;
4	$^{75}\text{As}$ ; $^{77}\text{As}$ ;	25	$^{129m}\text{Te}$ ; $^{130}\text{Te}$ ; $^{131m}\text{Te}$ ; $^{132}\text{Te}$ ;
5	$^{77}\text{Se}$ ; $^{78}\text{Se}$ ; $^{79}\text{Se}$ ; $^{80}\text{Se}$ ;	26	$^{127}\text{I}$ ; $^{129}\text{I}$ ; $^{130}\text{I}$ ; $^{131}\text{I}$ ; $^{133}\text{I}$ ; $^{135}\text{I}$ ;
6	$^{81}\text{Br}$ ;	27	$^{130}\text{Xe}$ ; $^{131}\text{Xe}$ ; $^{132}\text{Xe}$ ; $^{133}\text{Xe}$ ; $^{134}\text{Xe}$ ; $^{135}\text{Xe}$ ; $^{136}\text{Xe}$ ;
7	$^{82}\text{Kr}$ ; $^{83}\text{Kr}$ ; $^{84}\text{Kr}$ ; $^{85}\text{Kr}$ ; $^{86}\text{Kr}$ ;	28	$^{133}\text{Cs}$ ; $^{134}\text{Cs}$ ; $^{135}\text{Cs}$ ; $^{136}\text{Cs}$ ; $^{137}\text{Cs}$ ;
8	$^{85}\text{Rb}$ ; $^{87}\text{Rb}$ ;	29	$^{134}\text{Ba}$ ; $^{136}\text{Ba}$ ; $^{137}\text{Ba}$ ; $^{138}\text{Ba}$ ; $^{140}\text{Ba}$ ;
9	$^{86}\text{Sr}$ ; $^{88}\text{Sr}$ ; $^{89}\text{Sr}$ ; $^{90}\text{Sr}$ ;	30	$^{139}\text{La}$ ; $^{140}\text{La}$ ;
10	$^{89}\text{Y}$ ; $^{91}\text{Y}$ ;	31	$^{140}\text{Ce}$ ; $^{141}\text{Ce}$ ; $^{142}\text{Ce}$ ; $^{143}\text{Ce}$ ; $^{144}\text{Ce}$ ;
11	$^{90}\text{Zr}$ ; $^{91}\text{Zr}$ ; $^{92}\text{Zr}$ ; $^{93}\text{Zr}$ ; $^{94}\text{Zr}$ ; $^{95}\text{Zr}$ ; $^{96}\text{Zr}$ ;	32	$^{141}\text{Pr}$ ; $^{142}\text{Pr}$ ; $^{143}\text{Pr}$ ;
12	$^{93}\text{Nb}$ ;	33	$^{142}\text{Nd}$ ; $^{143}\text{Nd}$ ; $^{144}\text{Nd}$ ; $^{145}\text{Nd}$ ; $^{146}\text{Nd}$ ; $^{147}\text{Nd}$ ;
13	$^{95}\text{Mo}$ ; $^{96}\text{Mo}$ ; $^{97}\text{Mo}$ ; $^{98}\text{Mo}$ ; $^{99}\text{Mo}$ ; $^{100}\text{Mo}$ ;	34	$^{148}\text{Nd}$ ; $^{150}\text{Nd}$ ;
14	$^{99}\text{Tc}$ ;	35	$^{147}\text{Pm}$ ; $^{148}\text{Pm}$ ; $^{148m}\text{Pm}$ ; $^{149}\text{Pm}$ ; $^{151}\text{Pm}$ ;
15	$^{100}\text{Ru}$ ; $^{101}\text{Ru}$ ; $^{102}\text{Ru}$ ; $^{103}\text{Ru}$ ; $^{104}\text{Ru}$ ; $^{106}\text{Ru}$ ;	36	$^{147}\text{Sm}$ ; $^{148}\text{Sm}$ ; $^{149}\text{Sm}$ ; $^{150}\text{Sm}$ ; $^{151}\text{Sm}$ ; $^{152}\text{Sm}$ ;
16	$^{103}\text{Rh}$ ; $^{105}\text{Rh}$ ;	37	$^{153}\text{Sm}$ ; $^{154}\text{Sm}$ ;
17	$^{104}\text{Pd}$ ; $^{105}\text{Pd}$ ; $^{106}\text{Pd}$ ; $^{107}\text{Pd}$ ; $^{108}\text{Pd}$ ; $^{110}\text{Pd}$ ;	38	$^{153}\text{Eu}$ ; $^{154}\text{Eu}$ ; $^{155}\text{Eu}$ ; $^{156}\text{Eu}$ ; $^{157}\text{Eu}$ ;
18	$^{109}\text{Ag}$ ; $^{111}\text{Ag}$ ;	39	$^{155}\text{Gd}$ ; $^{156}\text{Gd}$ ; $^{157}\text{Gd}$ ; $^{158}\text{Gd}$ ; $^{159}\text{Gd}$ ;
19	$^{111}\text{Cd}$ ; $^{112}\text{Cd}$ ; $^{113}\text{Cd}$ ; $^{114}\text{Cd}$ ; $^{115}\text{Cd}$ ; $^{115m}\text{Cd}$ ; $^{116}\text{Cd}$ ;	40	$^{159}\text{Tb}$ ; $^{160}\text{Tb}$ ;
20	$^{115}\text{In}$ ; $^{115m}\text{In}$ ;	41	$^{160}\text{Dy}$ ; $^{161}\text{Dy}$ ; $^{162}\text{Dy}$ ; $^{163}\text{Dy}$ ; $^{164}\text{Dy}$ ;
21	$^{115}\text{Sn}$ ; $^{116}\text{Sn}$ ; $^{117}\text{Sn}$ ; $^{118}\text{Sn}$ ; $^{119}\text{Sn}$ ; $^{120}\text{Sn}$ ; $^{121}\text{Sn}$ ; $^{122}\text{Sn}$ ;		

\* m metastable

At present, although some cross section data are available for some fast reactor fission products, they cannot satisfy the calculation requirements of the FP process. We therefore used the cross section data given in Ref 2 for 192 fission products in 127 groups. To meet the FP process calculation procedures, we used the fission spectrum for neutrons with an energy greater than 2.33 MeV and the  $\phi(E) = 1/E$  spectrum for those with an energy less than 2.33 MeV. The 127 groups were first reduced to 27 groups and further reduced to 4 groups using the fast reactor spectrum.

The yield of the fission products directly affects the calculation results, we used the fast fission yield data of  $^{235}\text{U}$ ,  $^{238}\text{U}$  and  $^{239}\text{Pu}$  in Ref 3 and cross checked them with the data in Ref 4. Since Ref 3 did not give the fast fission data on  $^{240}\text{Pu}$ ,  $^{241}\text{Pu}$  and  $^{242}\text{Pu}$ , we used the  $^{239}\text{Pu}$  data for  $^{240}\text{Pu}$  and used the  $^{241}\text{Pu}$  thermal fission yield for the fast fission yield of  $^{241}\text{Pu}$  and  $^{242}\text{Pu}$ . This substitution is justified by the assumption that the energy dependence of the yield is not strong. In our calculation we treated the yield data in the following manner: for fission products first appeared on the fission chain, we used the recommended cumulation yield and for others we used the independent yield. The cumulation yield of a given fission product is the sum of the independent yield of that product and all the independent yields of the preceeding products. In this scheme, some of the short-lived products are also included in the calculation,

The half-lives  $T_{1/2}$  of the fission products are taken from Ref 3 and they are in basic agreement with the data given in Ref 5.

### III. Calculation Results

The accumulation of the fission products in the core depends on the core composition and the neutron flux at the core. Using high concentration uranium oxide as fuel in the core, the concentration is 90 percent for  $^{235}\text{U}$  and 10 percent for  $^{238}\text{U}$  and the power density is  $675 \text{ W/cm}^3$ .

The  $X_i$  value for a given time can be calculated for the 164 fission products. The values of  $X_i$  for 64 fission products are based on a burnup rate of  $50,000 \text{ MW}\cdot\text{day/ton}$ . As a comparison, we also listed the  $X_i$  values for  $5,000 \text{ MW}\cdot\text{day/tons}$ . Figure 1 shows the concentration  $N_i$  of 11 important fission products as a function of burnup time and Figure 2 shows the  $X_i$  values of 10 important fission products as function of the burnup time.

The calculation shows that

(1) In contrast to a thermal neutron reactor, there are no fission products in the fast reactor with particularly large cross sections, like those of  $^{135}\text{Xe}$  and  $^{149}\text{Sm}$  in a thermal neutron reactor. In the fast zone,  $^{101}\text{Ru}$  absorbs the most neutrons and accounts for 10 percent of the total absorption in the entire burnup process.  $^{99}\text{Tc}$  and  $^{133}\text{Cs}$  are next (see Table 2).

Figure 1 Concentration of important fission products as a function of burnup time

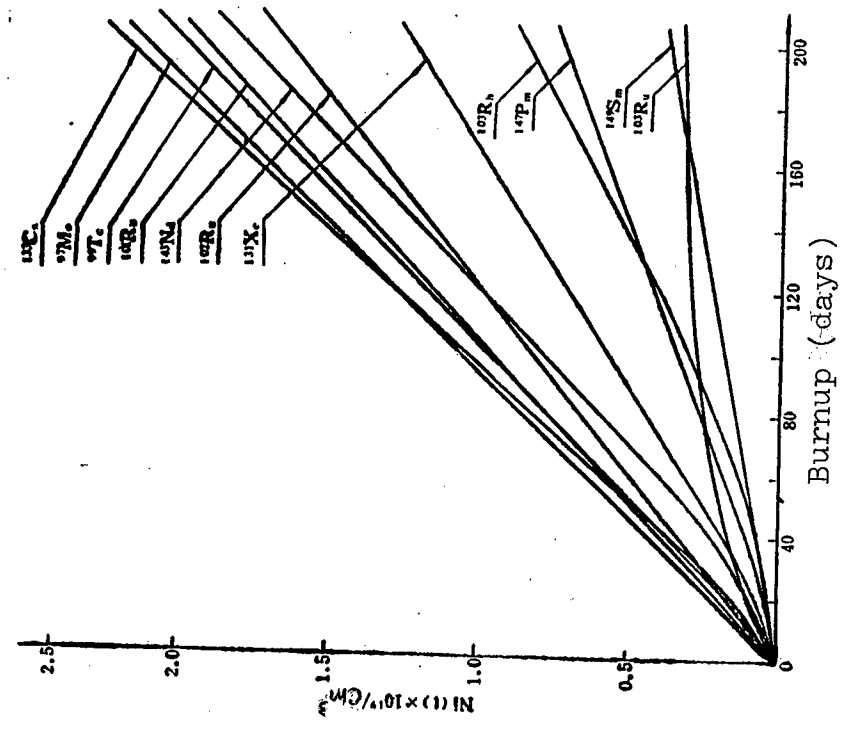


Figure 2  $X_i$  of important fission products as a function of burnup time

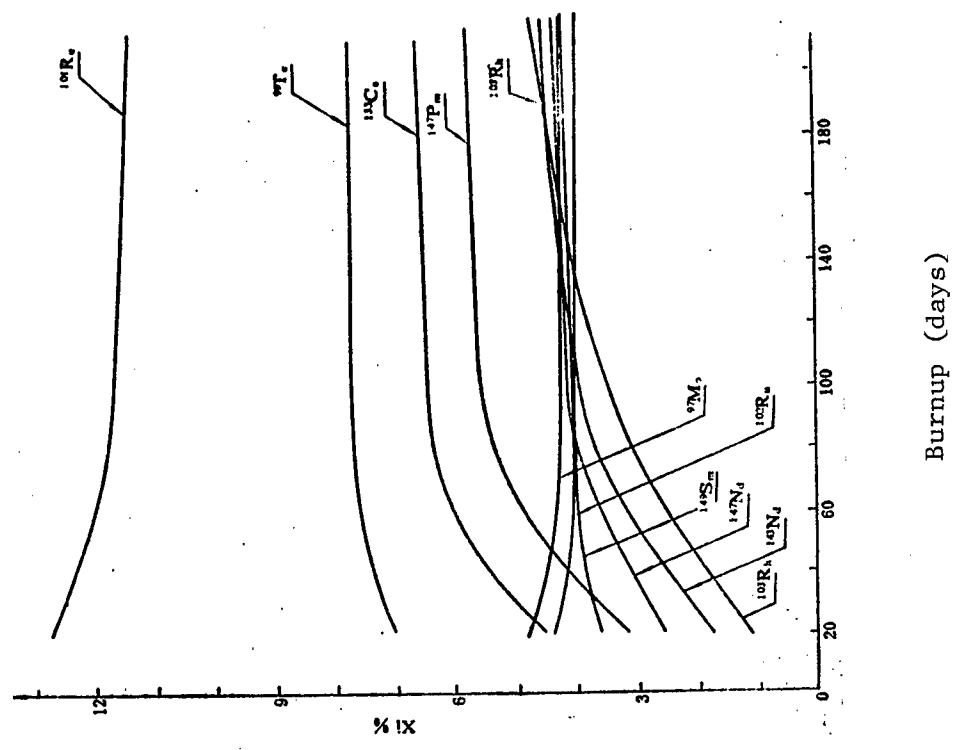


Table 2  $X_i$  values of 64 fission products

		5,000 MW·day/ton percent	50,000 MW·day/ton percent			5,000 MW·day/ton percent	50,000 MW·day/ton percent
No.	Product			No.	Product		
1	<sup>101</sup> Ru	12.72	11.35	35	<sup>91</sup> Zr	0.114	0.575
2	<sup>99</sup> Tc	7.06	7.71	36	<sup>144</sup> Nd	0.0591	0.535
3	<sup>133</sup> Cs	4.54	6.60	37	<sup>144</sup> Ce	0.737	0.524
4	<sup>147</sup> Pm	3.19	5.72	38	<sup>143</sup> Pr	3.42	0.512
5	<sup>103</sup> Rh	1.12	4.63	39	<sup>95</sup> Nb	0.232	0.461
6	<sup>143</sup> Nd	1.77	4.50	40	<sup>127</sup> I	0.329	0.432
7	<sup>131</sup> Xe	2.65	4.34	41	<sup>147</sup> Sm	0.411	0.410
8	<sup>97</sup> Mo	4.72	4.22	42	<sup>95</sup> Zr	0.974	0.403
9	<sup>149</sup> Sm	3.69	4.15	43	<sup>152</sup> Sm	0.398	0.361
10	<sup>102</sup> Ru	4.42	3.97	44	<sup>92</sup> Zr	0.384	0.344
11	<sup>151</sup> Sm	3.52	3.37	45	<sup>94</sup> Zr	0.325	0.292
12	<sup>98</sup> Mo	3.59	3.22	46	<sup>137</sup> Cs	0.314	0.280
13	<sup>148</sup> Nd	3.02	2.71	47	<sup>91</sup> Br	0.297	0.266
14	<sup>95</sup> Mo	0.0781	2.27	48	<sup>138</sup> Ba	0.288	0.258
15	<sup>135</sup> Cs	2.16	2.02	49	<sup>91</sup> Y	0.638	0.246
16	<sup>132</sup> Xe	1.76	1.99	50	<sup>109</sup> Ag	0.243	0.218
17	<sup>105</sup> Pd	1.69	1.87	51	<sup>147</sup> Nd	1.715	0.215
18	<sup>100</sup> Mo	1.88	1.68	52	<sup>90</sup> Sr	0.237	0.211
19	<sup>103</sup> Ru	4.77	1.41	53	<sup>87</sup> Rb	0.203	0.182
20	<sup>141</sup> Pr	0.356	1.32	54	<sup>82</sup> Kr	0.179	0.160
21	<sup>93</sup> Zr	1.42	1.27	55	<sup>136</sup> Xe	0.151	0.135
22	<sup>153</sup> Eu	1.14	1.16	56	<sup>84</sup> Kr	0.138	0.124
23	<sup>146</sup> Nd	1.14	1.02	57	<sup>106</sup> Ru	0.139	0.106
24	<sup>142</sup> Ce	0.751	0.953	58	<sup>131</sup> I	0.948	0.104
25	<sup>129</sup> I	0.932	0.933	59	<sup>88</sup> Sr	0.107	0.0957
26	<sup>134</sup> Xe	0.849	0.761	60	<sup>154</sup> Sm	0.0745	0.0667
27	<sup>104</sup> Ru	0.856	0.758	61	<sup>99</sup> Mo	0.833	0.0751
28	<sup>139</sup> La	0.797	0.715	62	<sup>133</sup> Xe	0.591	0.0648
29	<sup>96</sup> Zr	0.615	0.674	63	<sup>89</sup> Sr	0.162	0.0565
30	<sup>107</sup> Pd	0.728	0.653	64	<sup>149</sup> Pm	0.517	0.0465
31	<sup>85</sup> Rb	0.714	0.642				
32	<sup>140</sup> Ce	0.244	0.619				
33	<sup>83</sup> Kr	0.606	0.614				
34	<sup>148</sup> Nd	0.651	0.591				



(2) The neutron absorption of the 25 fission products with the largest  $X_i$  values is 74.29 percent for 5,000 MW·day/ton and 84.39 percent for 50,000 MW·day/ton. These 25 products are  $^{101}\text{Ru}$ ,  $^{99}\text{Tc}$ ,  $^{133}\text{Cs}$ ,  $^{147}\text{Rm}$ ,  $^{103}\text{Rh}$ ,  $^{143}\text{Nd}$ ,  $^{131}\text{Xe}$ ,  $^{97}\text{Mo}$ ,  $^{149}\text{Sm}$ ,  $^{102}\text{Ru}$ ,  $^{151}\text{Sm}$ ,  $^{98}\text{Mo}$ ,  $^{145}\text{Nd}$ ,  $^{95}\text{Mo}$ ,  $^{135}\text{Cs}$ ,  $^{132}\text{Xe}$ ,  $^{105}\text{Pd}$ ,  $^{100}\text{Mo}$ ,  $^{103}\text{Ru}$ ,  $^{141}\text{Pr}$ ,  $^{93}\text{Zr}$ ,  $^{153}\text{Eu}$ ,  $^{146}\text{Nd}$ ,  $^{142}\text{Ce}$ ,  $^{129}\text{I}$ . These products should be first considered in the fast reactor burnup calculation and in the calculation of the fission product total cross section.

(3) The value of  $X_i$  varies with the burnup rate (see Fig 2). For short-lived fission products,  $X_i$  is greater at low burnup and smaller at high burnup. For long-lived fission products,  $X_i$  has a greater value at high burnup than at low burnup. For example, the half-life of  $^{103}\text{Ru}$  is 39.7 days and its  $X_i$  is 4.77 percent at 5,000 MW·day/ton and drops to 1.41 percent at 50,000 MW·day/ton. The half-life of  $^{103}\text{Rh}$  is almost infinity and its  $X_i$  value is 1.12 percent at 5,000 MW·day/ton and rises to 4.63 percent at 50,000 MW·day/ton.

The author thanks Xue Youyi [5641 0645 5030] for providing the FP codes and assisting the calculation.

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CSO: 4008/40

APPLIED SCIENCES

SHANGHAI COMPANY RECYCLES WASTE MATERIALS

OW170849 Beijing XINHUA in English 0759 GMT 17 Nov 84

[Excerpts] Shanghai, 17 Nov (XINHUA)---Crowds are flocking to an exhibition here displaying slippers, writing paper, plant fertilizers and other goods, which have been made out of waste materials.

Discarded plastic soles, feathers, rags, waste paper and animal bones have been recycled to produce the goods on show.

The exhibition on the utilization of waste materials, organized by the Shanghai Municipal Material Recovery and Utilization Company, runs until December 3.

According to the exhibition, 23.7 million tons of waste materials were collected in Shanghai between 1957 and 1983. The products made from the waste materials were valued at 4.9 billion yuan (about 1.96 billion U.S. dollars).

The city has a population of 11 million and 8,000 factories, and about 4,100 tons of industrial wastes and domestic refuse are discarded every day.

Employing 24,000 people, the Shanghai Municipal Material Recovery and Utilization Company has stationed permanent workers at 2,000 large factories to collect waste materials, which are recycled at 15 plants.

The company also regularly visits small factories, shops, hospitals, schools and government organizations.

The Shanghai Rare Metal Extracting Plant recovered 110 kilograms of gold and 20,030 kilograms of silver last year from 460 tons of waste materials.

CSO: 4010/28

APPLIED SCIENCES

SHANGHAI CEREMONY SEES OFF ANTARCTIC SURVEY TEAMS

OW201151 Beijing XINHUA Domestic Service in Chinese 1624 GMT 19 Nov 84

[Excerpts] Shanghai, 19 Nov (XINHUA)--A ceremonious meeting was held in Shanghai today to send off China's first Antarctic survey teams. Wu Heng, chairman of the National Antarctic Survey Committee, addressed the meeting. He called on all the members of the Antarctic survey teams to accomplish with concrete deeds the goal set by Comrade Deng Xiaoping, that is: "Make a contribution to mankind's peace through the South Pole," revitalize China, and win honor for the motherland with rich results.

Luo Yuru, vice chairman of the National Antarctic Survey Committee and director of the State Oceanography Bureau, presided over the meeting. The team emblem of the China Antarctic survey team hung above the rostrum. In front of the rostrum had been placed a gold-plated red-copper station sign, which will be posted at the China Antarctic survey station and a gold-plated copper tablet engraved with Comrade Deng Xiaoping's inscription, "Make a contribution to mankind's peace through the South Pole." Wu Heng said: China's first survey of the Antarctic Ocean and the Antarctic Continent will turn a new page in China's history of scientific survey. The survey team will name the first scientific survey station to be constructed in the Antarctic the Great Wall Station because the Great Wall is the pride of the Chinese nation. It is hoped that the survey team will take the Chinese nation's fine tradition to the South Pole.

Guo Kun, leader of the Antarctic Continent survey team, and Jin Qingming, leader of the Antarctic Ocean survey team, spoke on behalf of all team members, saying that their strength came from the motherland, the people, and the respected and beloved party and that they would go all out to fight a brilliant quick-decision battle for building a station on the Antarctic Continent and for making a pioneering achievement in the Antarctic Ocean survey so as to live up to the great trust of the party and the people.

Li Yaowan, political commissar of the Navy, Ruan Chongwu, vice mayor of Shanghai; Fang Qiang, member of the CPC Central Committee's Advisory Commission; and Zhang Ming, deputy commander of the Nanjing Military Region, also spoke at the meeting.

CSO: 4008/130

APPLIED SCIENCES

CHINESE ANTARCTIC EXPEDITION LEAVES SHANGHAI

OW200929 Beijing XINHUA in English 0859 GMT 20 Nov 84

[Text] Shanghai, 20 Nov (XINHUA)--The 500-member scientific expedition to the Antarctic left here today aboard two ships.

To applause from 1,000 well-wishers, Wu Heng, chairman of the Chinese National Committee for Antarctic Research, presented the expedition with a Chinese national flag and a bronze plaque inscribed by Deng Xiaoping: "Towards peaceful utilization of Antarctic by man".

Scientists aboard the Xiangyanghong 10 will do 40 days research in 350,000 square kilometers of the krill-rich southern ocean near the Antarctic peninsula. They will survey biological resources and study hydrology, meteorology, geophysics, chemistry and geology.

The ship carries two cold laboratories to bring back live krill for further research.

The naval vessel J121 responsible for salvage and rescue carries a helicopter and will transport the scientists and their supplies to Antarctica and help build China's first summer station on the continent.

The expedition has received nationwide support. Over 100 factories and research institutes have made equipment including a satellite telecommunications system, an advanced radar detector, sonars fire-proof walls and carpets, and special glass. The Shanghai shipyard designed and built two small landing boats in three months.

The expedition carries 120 tons of food and 200 drugs.

CSO: 4010/28

## APPLIED SCIENCES

### BRIEFS

NEW COLD-RESISTANT LIFEJACKET--Shanghai, 10 Nov (XINHUA)--China has developed a new cold-resistant lifejacket, which can help people survive for hours after they fall into icy seas, according to the makers. The nylon jacket coated with polyurethane is also fitted with a battery, which lights up a red, flashing "SOS" signal as soon as it contacts water. This can be seen by ships up to two nautical miles away. An official of the Shanghai Diving Equipment Factory, which trial-produced the jacket with a factory in Wuhu, Anhui Province, said the body temperature of the user would drop by no more than two degrees centigrade six hours after a fall into water as cold as zero to two degrees centigrade. The temperature of the body's exposed parts, such as hands and feet, would be kept at no less than 10 degrees. The official said that unprotected people would die in freezing water in a maximum of 15 minutes. [Text] [Beijing XINHUA in English 0849 GMT 10 Nov 84 OW]

CSO: 4010/28

SUCCESSFUL CASE OF ARTIFICIAL INSEMINATION USING WASHED SPERM

Shanghai ZIRAN ZAZHI /NATURE JOURNAL/ in Chinese No 6, Jun 84 pp 422-423

/Article by Wang Yifei /3769 0001 7378/, Xu Wenhao /1776 2429 3493/, Qin Shixiao /4440 4258 2556/, Xu Xiongxin /1776 7160 1800/ and Ho Qiju /0149 0366 0036/:

"The First Successful Case in China of Artificial Insemination Using Washed Sperm From an Immunological Infertile Man"/

/Text/ In nature, there are some "unknown causes" for infertility in patients. Among these sterile couples, some females have normal ovulation and menstrual period, and a clear oviduct. Examinations show the male's semen to be in the normal range, with no abnormality in his sexual functions. The "unknown causes" indicates only a temporary lack of knowledge on the pathological reasons and their mechanisms. Detailed studies and analyses of the pathological changes of these patients will not only provide clues to the clinical diagnoses and treatment of infertility but can also provide some new thoughts on the study of contraception.

Sperm membranes possess extremely important biological functions: They form specific antigenic determinants for sperms, participate in the process of the ability acquisition of sperm, participate in the recognition process of sperm and egg, and they are the foundation of insemination. In recent years, we have applied exogenous agglutinin (lectin) to carry out systematic research<sup>1</sup> on the sugar base composition and functions of the membrane surface of sperm. Lectin may be selectively combined with sugar base of cell membrane, and have been widely used as a molecular probe in observing the cell membrane antigen. We have selected three kinds of lectins--malt agglutinin (WGA), sword bean globulin A (Con A), and soybean agglutinin (SBA) to be used in the location and quantitative study of sperm membrane lectin of 110 receptors with normal fertility.<sup>2</sup> We have verified the definite existence of WGA, Con A, and SBA receptors in the sperm surface of normal males. There are some differences in the sugar base specificity of these three lectins: WGA has N-acetylglucosamine and sialic acid, Con A has D-mannose and D-glucose, and SBA has D-galactose and N-acetylgalactose. There are also differences of these three lectins in their locations on the sperm membranes of the receptors: the WGA receptor has more flagellum and acrosome posterior, Con A receptor has more cephal, and the SBA receptor has more homogeneous distribution. We have also used spectrophotometric method to measure the light density variance (values) of human sperm agglutinn reaction caused by lectin, and have also used this as an indicator to measure the number of receptors of the human sperm membrane lectin.

On this basis, we examined the sperm membrane lectin receptor of 110 cases of infertile patients with "unknown causes." The results revealed that 69 cases have clearly indicated decreased or deficient WGA receptors of sperm membranes. From the pathological point of view, there may be two possibilities for the depletion of the human sperm membrane WGA in the receptors: one may be due to genetic defects, causing cell membrane glycocalyx defect, which results in a lack of receptors that can combine with WGA, the second is that the WGA receptor is covered by some substance and cannot be detected. In these cases, there are some patients whose sperm membrane WGA receptor are depleted and sperm-resistant antibodies exist in the serum. Using specialized immune beads /immunoglobulin/ for detecting IgG, IgA, and IgM, we have found that the surface of the sperm membrane of these patients are covered by immune beads, therefore, we can say that the depletion of the sperm membrane WGA receptor of these patients may be the result of their being covered by immunoglobulin.

The widely used treatment for this kind of infertility has been to use a large dose of glucosteroid or a small dosage intermittently of medicine, but the curative effect is not very good, and there are definite side effects.<sup>3</sup> Recently, we have given out small dosages of  $\beta$ -methasone in intervals, and it has definite curative effect. In recent years, we have begun trying out cleansing method. After washing away the antibodies on the surface of the sperm membrane, artificial insemination treatment is carried out.<sup>4</sup> It was reported in NEWS IN MED. (3, 7(1983) 13) in 1983 that a couple who had been married for nearly 2 years without a resultant conception. There were sperm-resistant antibodies in the husband's semen and serum. After processing the semen, a first case of successful conception was reported. After using the Tyrode fluid to cleanse the sperm, 0.2ml of cleansed suspended sperm was injected into the cervix, conception was achieved, and a healthy infant girl was born. The total success rate was about 10 percent.

About the time of the aforementioned report, we carried out sperm cleansing method on four immunological infertile patients. One of them was successful, and a healthy infant boy was born. We describe the case in the following.

The patient was a 34-year-old male, married 6 years without children. The female had normal menstruation, basal diaphasic body temperature, and her oviduct was clear. The male had a history of prostatitis, but each indicator of the semen examination was within normal range, and several treatments were ineffective. The 8 June 1982 examination in our clinic revealed a depletion of sperm membrane WGA receptor, Con A receptor, and SBA receptor, and there were sperm agglutinin antibodies and immobilizing antibodies in the serum. Initially strong pineal (?) treatment was used for 2 months, then  $\beta$ -methasone treatment was used for 2 months. During the medication period, WGA receptor reappeared for a while, but after medication was stopped, WGA receptor disappeared again. During this time, the patient's wife could not conceive. Examination was again conducted on 7 March 1983, it showed the depletion of sperm membrane WGA receptor, and there are a lot of immune bead covering the sperm membrane, indicating the depletion of WGA receptor was due to the presence of immunoglobulin on the membrane.

While studying the external fertilization of human sperm, Aitken and Wang Yifei have discovered the elevation of osmotic pressure sperm ability acquiring fluid (?) and the lowering of protein contents can accelerate the removal of material on the surface of sperm membrane,<sup>5</sup> and they used hypertonic BWW fluid (osmotic pressure of 405 mOs/kg). Based on this research, we have learned to try the hypertonic BWW fluid as cleansing fluid for sperm, in order to improve the cleansing effect. On 17 March 1983 we used hypertonic BWW fluid to clean the sperm of the patient, we discovered the reappearance of sperm membrane WGA receptor after cleansing, and at the same time, the definite decrease of adhesivity of the immune beads /immunoglobulin/ on sperm membrane surface, so it was decided to use hypertonic BWW fluid for cleansing in the artificial insemination process.

Fresh semen was taken from the patient during his wife's ovulation period, it was cleansed twice in hypertonic BWW fluid, it was continued in 37°C water bath in hypertonic BWW fluid and cultured for a half hour. Afterward, it was returned to the original isotonic BWW fluid, the cleansed suspension sperm was then injected into the wife's cervix. Four injections were made on 16 May, 18 May, 13 June and 15 June 1983, and the June artificial insemination achieved success. A healthy, normal 2,800 gram infant boy was born on 11 March 1984.

From this successful experiment, we have gained the following insights:

1. The cell membrane glycocalyx is an important component in the structure of cell function, in the making and maturation of the sperm membrane glycocalyx in the sperm, and it is the key effect to ability acquisition and insemination.<sup>6</sup> Currently, the research on sperm membrane glycocalyx is still in the embryonic stage. We consider lectin to be an effective tool in the research of sperm membrane glycocalyx. Research on various lectin receptors' positions and qualities may provide many valuable clues for the molecular level clarification of sperm membrane structure and functions, and it has significant theoretical meaning.

2. Comparing the micro-differences between the sperm membranes of normal and infertile people has not only clarified the infertile pathological mechanism at cellular and molecular levels, but also has set a firm foundation to raise the diagnostic and therapeutic levels. For many years, diagnosis of immune infertility has relied on examining the antibodies in serum and semen or cervical mucus. It is common knowledge that the real effective part is the genital canal, especially the antibodies attached to the surface of the sperm membrane.<sup>7</sup> We have used the sperm membrane WGA receptor detection, with added immune bead test. It can analyze the sperm surface condition via audio-visual means, it is a simple but sensitive diagnostic method. It has been used in our clinical work, in which it is the first time the sperm membrane is determined as the indicator for diagnosis of infertility. Next, we applied, for the first time, hypertonic BWW fluid to cleanse sperm, once to remove antibodies on the sperm surface, two to accelerate ability acquisition, and it is worth further exploration to raise therapeutic effects. WGA receptor depletion and immune infertility are not completely the same. We believe that a significant portion of patients who suffer WGA receptor depletion may not be due to covering by antibodies, and the reasons for depletion of WGA receptor of these patients should be further looked into.



3. Infertility research and inquiries into contraception are complementary and mutually beneficial. Our research results indicate that the sperm membrane WGA receptor may be an important receptor on the sperm membrane: the disappearance of WGA receptor can cause infertility, the reappearance of WGA receptor can renew fertility. Accordingly, this may be a new contraception method if we can devise a cover for sperm membrane WGA receptor. Except for infertility, immunological infertile patients have normal organ functions; this is, after all, the goal of research on planned parenthood. Thorough research on immunological infertility can certainly open up new paths for immune contraception.

We sincerely thank WHO for the research training provided by its Human Reproduction Branch and the reagent provided by its Special Program Division.

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CSO: 4008/370

CHINESE, AMERICAN CRITERIA FOR SCHIZOPHRENIA COMPARED

Beijing ZHONGHUA SHENJING JINGSHENKE ZAZHI /CHINESE JOURNAL OF NEUROLOGY AND PSYCHIATRY/ in Chinese No 2, 23 Apr 84 pp 90-92

/Article by Chen Deyi /7115 1795 3085/, Yan Shanming /0917 -810 2494/ and Chao Yuzhen /1560 3768 3791/ of the Prophylactico-Therapeutic Psychiatric Hospital of Zhenjiang, Jiangsu: "The Clinical Practice of China's Diagnostic Consultative Criteria for Schizophrenia--Compared With the Diagnostic Criteria of the United States"/

/Text/ Schizophrenia is a key area of research in Chinese psychiatry; in order to make our research data more comparable with that of others, China's daignostic criteria for schizophrenia were formulated at the 1981 "Special Academic Conference on Schizophrenia." To probe the clinical applicability situation of China's diagnostic criteria, and compare them with international diagnostic criteria, we applied our domestic diagnostic criteria and the diagnostic criteria for schizophrenia in DSM-III to the diagnosis of a group of cases, and report our results:

1. Materials and methods: For the first half of 1982, in both the male and female wards of our hospital we collected a detailed case history from the 268 patients that were successively admitted into the hospital; they were given a psychiatric examination by two psychiatrists with clinical experience using the relevant portion of the "psychiatric state examination" (PSE); and combined with the observations made during their stay in hospital, their symptoms were appraised and decided upon. Then, this data was entered on registration forms containing the items from the initial draft of our domestic diagnostic criteria for schizophrenia as well as all the items from DSM III's diagnostic criteria for schizophrenia, and a separate diagnosis made from each of the two sets of criteria.
2. Results: Of the original group of 268 cases there were 111 males and 157 females. Of the 107 who were diagnosed as schizophrenic according to at least one of the above-mentioned sets of criteria, there were 51 males and 56 females ranging in age from 14 to 56 years, with an average age  $\pm$  standard deviation of  $26.1 \pm 8.46$  years. Fifty-two cases were admitted to hospital for the first time, and 55 cases were being readmitted or had been hospitalized several times, with an average of 1.7 hospitalizations. The course of the disease ranged from 3 months to 30 years, with an average of 5.2 years. Eleven cases (10.3 percent)

had a positive family history of the disease. Of these 107 cases, 89 met DSM-III's diagnostic criteria for schizophrenia, amounting to 33.2 percent of the cases successively admitted to hospital during the same period; and 102 cases met our domestic diagnostic criteria, amounting to 38.1 percent of the same group. There were 84 cases that met both sets of diagnostic criteria, and five cases that met DSM-III's diagnostic criteria but not our domestic ones. These five cases all failed to agree with our domestic diagnostic criteria because they were accompanied by hallucinogenic delusions of being harmed or envied, and were not accompanied by persistent, emotionally-disturbed auditory hallucinations. There were 18 cases that met the domestic diagnostic criteria but not DSM-III's diagnostic criteria for schizophrenia. Of these, 16 cases failed to meet DSM-III's diagnostic criteria because the course of the disease was less than 6 months, and two cases because the age for the first outbreak of the disease exceeded 46 years. Although the group of cases that met the domestic diagnostic criteria and the group that met DSM-III's criteria respectively made up 38.1 and 33.2 percent of the cases successively admitted to hospital during the same period, nevertheless when dealt with statistically there is not notable difference between them ( $\chi^2 = 1.3747$ ,  $P > 0.25$ ), and the Kappa of the two sets of diagnostic criteria was 0.81, indicating a coincidence far better than chance. This clearly indicates that our domestic diagnostic criteria have a great similarity to those of DSM-III.

Of the cases that met DSM-III's diagnostic criteria, there were 47 males and 42 females. Of the 102 cases that met the domestic diagnostic criteria, there were 51 each of males and females, amounting respectively to 45.9 and 32.5 percent of the male and female cases successively admitted to hospital during the same period, which, when the figures are treated statistically, means that female cases were notably fewer than male. As for age, our domestic diagnostic criteria did not place any limit, but only two cases met our domestic criteria yet did not meet DSM-III's criteria because their age exceeded 45 years. The average age  $\pm$  standard deviation of those who met the domestic diagnostic criteria was  $26.88 \pm 8.69$ ; the average age of those who met DSM-III's diagnostic criteria  $\pm$  standard deviation was  $26.21 \pm 8.24$ ; and when the two age groups were compared, there was no notable difference ( $t = 0.4359$ ,  $P > 0.5$ ). Therefore, it is definitely not only because the domestic criteria place no age limit that the cases with exceptionally high ages were included.

As for diagnostic symptoms, of DSM-III's symptomatic diagnostic criteria, the rate of appearance of the various symptoms is definitely not uniform. There were 56 cases, or 62.9 percent, of concomitant apathy or uncoordinated thought disturbance; 41 cases, or 46.1 percent, of peculiar delusions; 26 cases, or 29.2 percent, of critical-type or argumentative-type auditory hallucinations; 25 cases, or 28.1 percent, of concomitant hallucinogenic delusions of being harmed or envied, and 18 cases each, amounting to 20.2 percent, of persistent depressive or euphoric auditory hallucinations and of those with hypochondriac delusions or delusions of grandeur. Within a single case, the rate of appearance of symptoms was also not uniform. There were 40 cases in which 1 symptom appeared, 39 cases in which 2 symptoms appeared, 9 cases in which 3 symptoms appeared, and only 1 case in which 4 symptoms appeared. The great majority of cases, or 88.8 percent, manifested 1 to 2 symptoms.

The rate of appearance for the major symptoms in the domestic diagnostic criteria was also not uniform. There were 35 cases each, or 34.3 percent, of the so-called "characteristic delusion" and of apathy; 34 cases, or 33.3 percent, of "characteristic thought disturbance"; 29 cases, or 28.4 percent, of "characteristic verbal auditory hallucinations"; 25 and 24 cases respectively, or 24.5 and 23.5 percent respectively, of the feeling of being revealed and the feeling of being controlled; and of parathymia least of all, only 8 cases. Within each case the number of symptoms manifested was definitely not uniform. Forty-two cases manifested 1 symptom; 40 cases 2 symptoms; 14 cases 3 symptoms; 5 cases 4 symptoms; and 1 case 5 symptoms, with the majority, or 81.8 percent, manifesting 1 to 2 symptoms.

## Discussion

Due to the fact that the general concept of schizophrenia, and the diagnostic criteria for it, have till now not been unified, there is a tendency for the clinical diagnosis to be inconsistent. Some consider that the question of diagnosis is immaterial in psychiatry, and that casually giving patients entering hospital a diagnosis of schizophrenia also has at least a 70 percent chance of being accurate. Because of this, the scope of schizophrenia diagnosis is daily become broader, even to the extent of being used indiscriminately. This situation existed in Sweden in the early part of this century, and there was the same tendency in the United States during the seventies. China's past diagnosis of schizophrenia has perhaps been stricter. In the 1950's, schizophrenics accounted for only between 42.5 and 51.7 percent of in hospital psychiatric patients; during the 1960's there was a tendency for the percentage to rise; and by the 1970's it reached from 83.7 to 91.6 percent. The causes leading to this circumstance were manifold, but the fact that diagnostic criteria were not uniform is an important reason that cannot be overlooked. This caused the reliability and authenticity of diagnosis to be low, and made it very difficult for data to be compared. In order to unify people's understanding, and enable data to have comparability, for a long time many scholars have done a great deal of work to formulate diagnostic criteria for schizophrenia. For example, Carpenter's point evaluation diagnostic method, Schneider's primary symptom criteria, Feighner's research-use diagnostic criteria, and Spitzer's research-use diagnostic criteria, as well as the DSM-III that was developed from this basis. In 1981, at the Suzhou special academic conference on schizophrenia, and in combination with China's concrete clinical practice, China's diagnostic criteria for schizophrenia were formulated, and this will play a positive role to reverse the tendency to broaden China's diagnostic scope of schizophrenia. The results of this paper have indicated clearly that whether our domestic diagnostic criteria or those of DSM-III are used in diagnosis, the proportion of schizophrenics is still less than 40 percent of hospitalized cases. This result clearly indicates that schizophrenics who truly meet either the domestic or the foreign diagnostic criteria definitely do not form the bulk of China's hospitalized mental patients.

Of the original group of cases there were 89 that meet DSM-III's diagnostic criteria, and 102 cases that met the domestic diagnostic criteria. Statistically there was no notable difference between the two groups with regard to the proportion they comprised of the number of cases admitted to hospital during

the same period, and after correcting for chance unanimity the index number for the diagnostic unanimity rate was quite high ( $Kappa = 0.81$ ). DSM-III's diagnostic criteria stipulate at least 6 months for the course of the disease, and China's diagnostic criterion is 3 months. Because of this question of the course of the disease, there were 16 cases that met the domestic diagnostic criteria but not those of DSM-III. If these 16 cases are added, then the number of cases meeting each of the two sets of criteria is almost the same. This clearly indicates that China's diagnostic criteria are quite similar to DSM-III's diagnostic criteria for schizophrenia. China's diagnostic criteria include symptomatic criteria, that relating to the course of the disease, and criteria relating to the ability to adapt socially; and also require that somatic mental disorders, organic mental disorders, and affective disorders be eliminated at the outset. Their content is comparatively comprehensive, and easy to grasp; they are also comparatively convenient to use, and can after all be regarded as a useful clinical tool.

Our diagnostic criteria first lists the features of the disease's clinical structure: the incoordination syndrome, i.e., lack of coordination between psychomotor activity and the objective environment, lack of coordination among the processes of the various psychomotor activities, internal lack of coordination within the same psychomotor activity, and internal lack of coordination within the same mental symptom. Although this is an important concept, nevertheless it cannot serve as a workable diagnostic criterion. Because it is too inclusive and general, it is comparatively difficult to grasp, the assessments of various observers would be comparatively diverse and, moreover, it is merely a feature of the disease's clinical structure, and does not include other symptoms which have important diagnostic significance for the diagnosis of schizophrenia. For this reason, when we formulate a really workable set of criteria, we may consider discarding this item. Within the symptomatic criteria we separate major symptoms and secondary symptoms. Among the major symptoms, any symptom that is definite and uncontested can be used as the basis for diagnosis. However, although Bleuler considered affective disorders such as apathy and parathymia to be one of the prominent, basis symptoms of schizophrenia, nevertheless clinically it is really very difficult to rely solely on affective disorders to arrive at a diagnosis of schizophrenia. Because evaluations of affective disorders mostly rely on the observer's instinctive feelings, there will be relatively great disparities among various observers, thus lowering the reliability of the diagnoses. When diagnostic criteria for schizophrenia were formulated in foreign countries, either this item was not utilized as a diagnostic criterion (Feighner 1972), or it was not employed in isolation, and it was emphasized that there must be other, concomitant symptoms (Kendell 1978, Spitzer et al 1975, 1980. Although some scholars place importance on symptoms in this area, they also do not simply list categories, but have also formulated a scale for measuring the degree of apathy and dullness of feeling (Abrams et al 1978, Andreasen 1979), enabling their evaluations to be comparatively more objective. For this reason, China's diagnostic criteria should also be revised accordingly. Among the secondary symptoms of China's criteria, it is stipulated that if one symptom exists the possibility of schizophrenia should be considered, though it is not possible to make a diagnosis of schizophrenia. Among our group of cases, there were five cases that could not be diagnosed as schizophrenic because they were accompanied by hallucinogenic delusions and persistent auditory

hallucinations that were not accompanied by any emotional disorder. Therefore these secondary symptoms exist in name only, and it is suggested that they be either revised or discarded. The diagnostic criteria of DSM-III specify 6 months for the course of the disease, and the domestic diagnostic criteria specify 3 months, but what length of time should be specified after all is still open to discussion. How should the cases that agreed with the other items in the domestic criteria, but not with the one regarding the course of the disease, be diagnosed? This is dealt with neither in the diagnostic consultative criteria nor in China's "Classification of Mental Diseases" (1981), which has made it very difficult for diagnostic work. We suggest that in the classification of mental diseases, regarding the above-mentioned situation a category of "split-type mental aberration" or "schizophrenic-type" be added for borderline cases, which can be diagnosed correctly after further observation, and this will be convenient for discussing and forming general conclusions from the data.

In sum, the phenomenon of the broadening of the scope of China's diagnosis of schizophrenia is in great need of change, and our diagnostic criteria for schizophrenia, after being revised, can be a working system of diagnostic criteria of unified application. This is extremely beneficial to raising the level of China's diagnosis of schizophrenia.

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CHINESE CRITERIA FOR SCHIZOPHRENIA EVALUATED

Beijing ZHONGHUA SHENJING JINGSHENKE ZAZHI /CHINESE JOURNAL OF NEUROLOGY AND PSYCHIATRY/ in Chinese No 2, 23 Apr 84 pp 93-95

/Article by Zhang Mian /1728 0517/, Zheng Xueqian /6774 1331 6197/, Li Baowen /2621 1405 2429/ and Tao Shuntai /7118 7311 3141/ of the Tianjin Municipal Psychiatric Hospital: "An Evaluation of China's Diagnostic Criteria for Schizophrenia"/

/Text/ Before diagnostic criteria for schizophrenia are unified, it is difficult for research on this disease's biochemistry, transmission, and epidemiology to reach scientific conclusions. At present, a number of standardized diagnostic criteria for schizophrenia have been formulated, such as Feighner's diagnostic criteria, Carpenter's 12-point method, and Spitzer's RDC and DSM-III; the multiaxial form of DSM-III has been considered important in a good many countries. In 1981, a rough draft of China's diagnostic criteria was formulated at the special conference on schizophrenia convened in Suzhou by the Chinese Medical Association. Though these criteria have not yet been widely applied, nevertheless one can suppose that this is a regular diagnostic system for schizophrenia, about to be put into effect on a national scale for the first time. In clinical research over the past few years, we have tried these criteria. Through practice, we believe that they have considerable clinical value, but we also feel that they are inadequate. Therefore, they must await repeated evaluation and revision before they can be formally put into effect. In this article, using 190 patients originally diagnosed as schizophrenics as our clinical basis, we attempt to evaluate the diagnostic unanimity and the content of the Suzhou Conference's diagnostic criteria, with the aim of evaluating the issues of the diagnostic reliability and clinical acceptability of these criteria.

Clinical Information

The 190 cases were patients admitted to 1 of the 6 wards of our hospital for the first time. The method of selection was a random sample, made according to the order in which they were admitted. The standard for the initial diagnosis of the various cases was basically that embodied in the traditional Chinese concept of schizophrenia, i.e., split thought or paucity of thought, apathy, a disturbance of intentional activities, manifestations of the delusions or hallucinations of a split personality, as well as a lack of insight. A general survey of the cases is as follows: 154 males, 36 females; age ranged from 16

to 54 years, with an average of 27.7 years; educational background, 94 (49.5 percent) had a junior middle school education, 66 (34.7 percent) had senior middle school, 21 (11.1 percent) had an elementary school education or less, and 9 (4.7 percent) were at the university level. As for clinical types, there were 91 cases of hebephrenic, 81 cases of paranoia, 12 of other types, and 3 cases each of the catatonic type and the simple form.

Regarding the lack of clear items in the content of the Suzhou Conference's criteria, we referred to corresponding general concepts and have made the following supplementary explanation: the characteristic thought disturbance should include disconnected thought (which can be manifested as split thought, incomprehensible speech, paucity of thought, blocking of thought, or phonetic association), as well as a clear disturbance of logical thought (which can be manifested as the coining of new words, or as inverted logic); the feeling of being understood is such that the patient really experiences the feeling that his thoughts are known by everyone around him, therefore we emphasize that there must be actual experience of the symptoms of thought audition (or thought changing into sound, or the symptom that one can read minds), and further delusory explanations. The feeling of being controlled is manifested in disintegrative symptoms of actual experience of feeling the body is moved by others, or having impulses imposed on them by others, and is definitely not merely an expression of delusion. The characteristic delusion should not include comparatively concrete, specific, or systematic delusions of being harmed or disliked that are, moreover, not attached to other symptoms. Apathy can also be manifested in the patient's feeling of having no affinity with any outside connection. The characteristic verbal auditory hallucinations include auditory hallucinations of a critical nature, argumentative nature, those that are persistent and, moreover, unconnected with mood, as well as functional auditory hallucinations.

Using the criteria thus annotated, of the 190 cases, 157 were rediagnosed as schizophrenic, a diagnostic unanimity rate of 82.6 percent. Of those who were eliminated from classification as schizophrenics by the Suzhou Conference's criteria, 9 cases failed to meet the symptomatic norms; 16 cases failed to meet criteria relating to the course of the disease; 6 cases had disorders in functioning socially prior to the onset of the disease; and 11 cases had additional symptoms that had to be eliminated from the diagnostic criteria. Of the cases that were eliminated from classification as schizophrenics, 15 were eliminated solely due to criteria relating to the course of the disease, 45.5 percent of the total. At the time of evaluating the criteria for which symptoms should be eliminated, a total of 10 patients demonstrated affective symptoms. According to our present diagnostic concepts, of those who were eliminated from classification as schizophrenics, the tendency of rediagnosis of a portion of them was as follows: of 91 cases that were originally diagnosed as hebephrenic-type schizophrenics, two cases tended to be rediagnosed as cases of affective disorder, along with one case each of split emotion type and reactive psychosis; of 81 cases of delusory-type and paranoid-type psychotics, along with 1 case each rediagnosed as split emotion type and atypical type psychotics; of 12 schizophrenics of yet other types, 3 tended to be reclassified as cases of affective disorder, along with 1 case each of paranoid psychosis and personality disorder; and 6 cases of the simple and catatonic types were still fundamentally



able to retain their original diagnoses. The observed results regarding the rate of manifestation of the various items of the Suzhou Conference's symptomatic norms were as follows: Of 157 cases of schizophrenia, the major symptoms with a comparatively high rate of manifestation were: apathy (68.8 percent), characteristic thought disturbance (58.6 percent), item B of the characteristic delusion (53.5 percent), and characteristic verbal auditory hallucinations (33.1 percent); of symptoms of secondary importance, there were: uncoordinated psychomotor excitement along with strange behavior (83.4 percent) and abulia (61.1 percent), and the rate of manifestation of the concomitant hallucinatory delusion was also comparatively high (27.4 percent); comparatively low in rate of manifestation were the feeling of being revealed (8.9 percent) and parathymia (18.5 percent).

In addition to the symptoms enumerated by the Suzhou Conference, we also recorded a number of other, comparatively prominent clinical symptoms: 60 cases of talking or muttering to oneself (38.2 percent), and 40 cases of laughing to oneself (25.5 percent).

Along with applying these criteria, we also used the schizophrenia portion of DSM-III to carry out a comparative rediagnosis of all the cases. One hundred and twenty-five cases were rediagnosed as schizophrenic by the DSM-III, a unanimity rate of 65.8 percent. Of the total number of cases, 31 cases were eliminated from diagnosis as schizophrenics solely because they did not meet the norms regarding the course of the disease--47.7 percent of those eliminated from diagnosis as schizophrenics by DSM-III. If only the cases that had actually established as schizophrenic by the Suzhou Conference's criteria were used as the sample for rediagnosis by DSM-III, the diagnostic unanimity rate between the two would be 79.6 percent (125/157). And if the two standards' differing norms regarding the course of the disease were not considered, the diagnostic unanimity rate would reach 87.9 percent (138/157). Under those two conditions, the difference in unanimity rate is not statistically significant ( $\chi^2 = 1.803$ ,  $P > 0.1$ ).

## Discussion

1. Among the Suzhou Conference's diagnostic criteria, the manifestation rate for the feeling of being understood was lowest, because in this article the limitations placed on this symptom were rather strict. At present we believe that the feeling of being understood is a phenomenon of both a disturbance of sense impressions and thought disturbance. Therefore, this symptom can only be expressed as "Other people know what is going on in my mind." We also believe that it is not possible to consider the feeling of being understood as an isolated item. When a patient's hallucinatory experience is clearcut, it can be classified as the characteristic verbal auditory hallucination; but when most of the patient's experience is delusory, then it can be classified as a delusory symptom. Passivity is acknowledged as a symptom of schizophrenia, therefore we thoroughly cover these in our annotation on the feeling of being controlled. Within the characteristic delusion, we consider that one should place a clear limitation on the general concept of delusory perception--that of distinguishing it from primary delusion. This article's additional conditions for delusory symptoms are based on DSM-III, with the aim of distinguishing

them from paranoid psychosis. In clinical practice, we feel that from a phenomenological point of view it is still difficult to distinguish strictly between parathymia and apathy, as there is generally conceptual overlap between the two. Therefore, we hope to evaluate these two items as a single symptom, i.e., the affective symptom of schizophrenia. In practice it has been discovered that the symptoms of secondary importance set forth in the Suzhou Conference's criteria are frequently the same as, or duplicate, the symptoms of other mental disorders or items on different standards. As seen in clinical practice, tension, excitement, or other unusual behavior are often manifested along with disturbances of thought or awareness; and disturbances in intentional activities can then be manifested as the lessened capacity for work, social relations, and individual life given as the second norm of our criteria. Therefore, it is equally possible that they need not be listed separately, but should in fact be combined again. Concomitant hallucinatory delusion is a diagnostic symptom in many foreign systems of diagnostic criteria, and in the results of this paper its rate of manifestation is also high. Therefore it should also be considered as a major symptom, like characteristic delusion. As shown by the results of this paper, talking to oneself, and laughing to oneself, are external manifestations of schizophrenia seen comparatively often in clinical practice, and it is possible, through the study of these symptoms, to come up with the symptoms of yet other mental disorders. Therefore, these will be dealt with in our annotation on behavioral disturbances.

In the Suzhou Conference's criteria, the norm regarding the course of the disease is limited to 3 months, rather broad in comparison with foreign standards, but we still consider it is necessary to suggest that, for patients where the entire course of the disease has been less than 3 months, once the symptoms of mental disturbance have been persistent for about 1 month, a diagnosis of schizophrenia should also initially be considered. This is in view of the results of this paper, of those cases which were eliminated by the criteria from diagnosis as schizophrenic, nearly half were due to not conforming to the condition of 3 months for the course of the disease. Second, as epidemiological investigations have shown, though schizophrenia is often a latent disease that arises progressively, nevertheless nearly one out of three cases still arise in a subacute or acute manner, and the course of the disease can be shorter than 2 months, and even a few weeks. Our view is that, a comparatively short time limit for the course of the disease is of advantage from the point of view of treatment and prognosis, and a comparatively long course of the disease can improve the diagnostic standard and the reliability. For this reason, among comparatively strict systems of diagnostic criteria that arise with different aims in mind, the question of just how long the criterion for the course of the disease really ought to be is in need of further discussion. Among the criteria's norms for which symptoms should be eliminated, we did not emphasize as being of first importance the distinction from affective disorder, and in this respect we differ from the foreign diagnostic systems. Systematic studies in recent years of diagnostic changes between schizophrenia and affective disorders reveal that of cases presently diagnosed as affective disorders, 56 percent had a previous diagnosis as schizophrenics, while of cases having an initial diagnosis as affective disorders, only from 2 to 8 percent later had the diagnosis changed to schizophrenia. This indicates that until now with regard to affective mental disorders the incorrect diagnoses are possibly due

to people having considered schizophrenia to be the commonest type of mental disorder. Similar research in China also indicates that our not placing importance on modern diagnostic criteria led to a diagnostic rate for affective mental disorders that was obviously lower than that of other countries. It also indicates that traditional diagnostic criteria really overlooked the distinctive significance of affective symptoms. The results of this paper reflect the same conclusion, in that the tendency of rediagnosis of those cases which were eliminated from diagnosis as schizophrenic was still mainly that of affective disorders, amounting to 27.3 percent (9/33). For this reason, in any new criteria that are formulated we should clearly propose, and resolve, the question of whether or not in the course of the pathogenesis there has been any appearance of affective symptoms.

2. The various kinds of current diagnostic criteria for schizophrenia are all making efforts to move in a certain direction, which is that of being concise, functional and effective. Therefore, it is necessary to draw on the patterns that have already been confirmed by clinical practice to formulate China's criteria. We have examined DSM-III with respect to China's sample of cases, and the fundamental diagnostic unanimity with our results indicates that DSM-III is appropriate for China. In the comparative results of this paper, the difference in the unanimity rate between DSM-III and the Suzhou Conference's criteria regarding the rediagnosis of the 190 cases was not statistically significant ( $\chi^2 = 3.301$ ,  $P > 0.05$ ).

In view of the culture we believe that in the wake of social and cultural developments, some clinical appearances, or symptoms, of schizophrenia may well undergo change. However, classical theory will definitely not become outdated. In fact, although the diagnostic criteria formulated by the various experts use different terminology, and the forms are all different, in essence none of them departs from the four basic symptoms of E. Bleuler, or from the conceptual categories of Mayer-Gross and Schneider. It is only that concepts which were generalized in the early years have now developed so as to be more distinct and limited. Relevant clinical research has pointed out that there is no significant difference in unanimity rate between modern diagnostic systems for schizophrenia and the diagnostic system of Kraepelin and Bleuler with regard to patients in the same disease groups. This indicates that there is still an internal connection between modern criteria and the original criteria. Therefore, our repeating certain traditional concepts in the new diagnostic criteria will be a natural result.

3. One can see that the concept of an "axis" was also introduced in the Suzhou Conference's diagnostic criteria; it is close to that of DSM-III; the sample of cases diagnosed by the two systems can fundamentally be compared with regard to type; and this will be of advantage for exchange between China and foreign countries. Therefore, this standard should be approved. But it should also be pointed out that it is still necessary to provide clear explanation and models for some of its content, and it is also necessary to undergo further discussion and reach a unity of understanding. Only in this way, can we avoid having the users each understand things in their own way and, in continuing to use this criteria, depart from the original intention of those who formulated it. Spitzer advocated that, the protection and improvement of the reliability and efficacy

of any diagnostic standard or measure cannot be separated from continuous examination in the light of all kinds of practice. We hope that this paper will inspire organized, planned and broad-ranging and incisive clinical practice and evaluation of the Suzhou Conference's diagnostic criteria, enabling this standard to be continually improved, and become our practical and effective clinical and research tool.

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## LIFE SCIENCES

### BRIEFS

JIANGSU POLDER NATURE RESERVE--Nanjing, 17 Nov (XINHUA)--China has set up its first nature reserve to protect a seaside ecological system and its native cranes in central Jiangsu Province. The nature reserve in Yancheng Prefecture covers an area of more than 46,000 hectares along 350 kilometers of Yellow Sea coastline. Hundreds of red-crested, white, hooded, white-naped and grey cranes fly here from northern China in October or early November each year for overwintering and fly back to northeast China and Inner Mongolia in March the following year. There are 15 known species of cranes in the world today and China has 9 of them. The haunting of cranes is an expression of good ecological conditions, ornithologists say, adding that these birds are of important value in studying biological evolution, genetics and bionics. Local government regulations and protective measures have helped the bird tide over the winter there safely. The nature reserve will help scientists in their study of seaside ecology, marine resources and domestication of cranes. [Text] [Beijing XINHUA in English 0737 GMT 17 Nov 84 OW]

CSO: 4010/28

## ENVIRONMENTAL QUALITY

### CHROMIUM BACKGROUND VALUES IN BEIJING'S SOILS, CROPS

Beijing ZHONGGUO HUANGJING KEXUE /ENVIRONMENTAL SCIENCES IN CHINA/ in Chinese  
No 2, 21 Apr 84 pp 44-49

/Article by Wang Hongkang /3769 1347 1660/ and Wu Jinru /0702 6855 1172/ of  
Beijing Agricultural University: "Chromium Background Values in Main Agricultural Soils and Crops in Beijing Area"/

/Summary/ The study of background values in soils and crops aims at obtaining basic environmental data for formulating environment standards and at an evaluation in understanding the circulation of trace elements and their supply levels, thus promoting agricultural output and studying the etiology of endemic diseases. The major agricultural soils in Beijing area are brown soil and grassy turf soil; the major field crops are corn, paddy rice and wheat. In a soil profile, four to seven layers were examined for chromium content. If the content values are consistent from topsoil to bottom soil, this constitutes the background value. For both soil types, the chromium content in topsoil is not greater than in bottom soil; therefore, the content in the topsoil of Beijing area can be taken as the background value, free of pollution. The background value of heavy metals in soil is related to the mother rock (of soil) and the soil-forming process. Generally, higher clay content in soil results in a higher content of heavy metals; this is why the chromium content in brown soil is significantly higher than in grassy turf soil of the Beijing area. For soils developed from different types of mother rock in Beijing, the chromium content is as follows, in increasing values: granogneiss, andesite, limestone, and sandstone (and granite). The highest chromium content is corn grown on brown soil while the lowest value is found in paddy rice grown on grassy turf soil. There is no significant difference in chromium content in wheat (on brown soil), wheat (on grassy turf soil) and corn (on grassy turf soil). In other words, the background chromium content values form the following relationship: corn (on brown soil) > wheat (on grassy turf soil) ≈ wheat (on brown soil) ≈ corn (on grassy turf soil) > paddy rice (on grassy turf soil). The high chromium value in corn (grown on brown soil) is related to the high chromium background values in brown soil. However, generally there is no apparent relationship between chromium content in crop and in soil; this is possible because the total chromium content (not the available chromium content) in soil is what was measured.

Three figures show sampling sites of background values (study) in soils and crops, normal distribution of chromium content in soils, and logarithmic normal distribution of chromium content in soils. Eleven tables show chromium content measurements in typical soils; elimination of anomalies in sample measurement results; chromium distribution properties and background values in Beijing's major agricultural soils; empirical probability of chromium content in top and bottom soil layers; of mountain, piedmont plain and plain; of different valley soils; and of grassy turf soil, brown soil and major agricultural soils in Beijing area.

This is a partial report on the Beijing-area chromium section from "Study of Background Values in Major Agricultural Soils and Crops" compiled in 13 provinces and municipalities for the Environmental Office (of the State Council) and Environmental Office (of the Ministry of Agriculture).

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CSO: 4009/4

## ENVIRONMENTAL QUALITY

### SOLID-LIQUID SEDIMENTATION OF HEAVY METALS AT MOUTH OF CHANG JIANG

Beijing HAIYANG XUEBAO /ACTA OCEANOLOGICA SINICA/ in Chinese No 2, 15 Mar 84  
pp 180-185

/Article by Chen Song /7115 2646/, Liao Wenzhuo /1675 2429 0587/ and Pan Jiezai /3382 4105 0375/ of Third Oceanography Institute Xiamen, State Oceanography Bureau: "Solid-Liquid Boundary Sedimentation Process of Heavy Metal Elements at the Chang Jiang Estuary: (I) Activities and Sedimentation Regime of Pb, Cu and Cd in Sediment Phase"/

/Summary/ This paper presents the surface layer sediment (at the Chang Jiang estuary) and the distribution of Pb, Cu and Cd in the soluble acid phase and crevice water; the relationship between the distribution and the environmental parameters are analyzed. It was discovered that most environmental parameters are related to sediment size, as well as organic matter content, iron oxide, and clay minerals; a certain correlation also exists between the parameters on the one hand, and Eh and pH, on the other. A quasi-equilibrium relationship holds between crevice water and sediment. The distribution between Pb and Cu in two (solid and liquid) phases is mainly controlled by a process of adsorption--desorption and sedimentation--dissolution of iron oxide and organic matter; Cd distribution is mainly controlled by CdS sedimentation--dissolution.

Two figures show the distribution of sampling stations, as well as the medium size of Cu, Pb and Cd, and distribution of  $\text{Fe}_2\text{O}_3$ , organic matter and clay in sediment. Three tables show the distribution of Pb, Cu and Cd in surface layer sediment phase at the Chang Jiang estuary, major constituents of sediments and environmental parameters, and the relationship between heavy metal contents and the related parameters.

The paper was received for publication on 10 November 1982.

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## ENVIRONMENTAL QUALITY

### SENSITIVITY OF ATMOSPHERIC ENVIRONMENT ANALYZED

Beijing HUANG JING KEXUE /JOURNAL OF ENVIRONMENTAL SCIENCE/ in Chinese No 3,  
30 Jun 84 pp 70-73

/Article by Wang Luguang /3769 6424 0342/ of Baoding Municipal Environment  
Protection Monitoring Station: "Sensitivity Analyses on Atmospheric Environ-  
ment Over Mainland China"/

/Summary/ There is climatic diversity in China's vast expanses. For example,  
in mean annual wind speed, values range from 0.5 to 0.7 m/sec in the well-known  
"deadwater zone" Wanxian and Enshi area with the still wind occurrences as high  
as 84 to 86 percent. In the Manchurian plain, the mean annual wind speed ranges  
from 3.0 to 5.0 m/sec with the still wind occurrence ranging from 2 to 10 per-  
cent. For the same intensity of pollution impact, pollution results are much  
more serious in the Wanxian area. In other words, the atmospheric environment  
of Wanxian is very sensitive to the impact of pollution. What is the difference  
in atmospheric environment among various areas in adapting to the impact of  
pollution? What are the degree of difference and the distribution rule? The  
author attempts to define an index, and the sensitivity of atmospheric environ-  
ment, in analyzing China's atmospheric environment.

The adaptation of atmospheric environment depends on three factors: the area's  
environment function, diluting capability of atmosphere, and its diffusion  
capability. The environment function is expressed by land use practices, such  
as natural conservation area, scenic area, residential area, and rural villages.  
The atmospheric diluting capability is expressed by mean wind speed, and the  
diffusing capability is expressed as frequencies of various types of stability.  
Apparently, the more strict the atmospheric environmental quality, the lower the  
mean wind speed, and the greater the frequencies of stability; the more sensitive  
is the atmospheric environment of the area.

Atmospheric environment sensitivity is derived from the mean pollution area S,  
which is mainly determined by the stability frequency and mean annual wind speed.  
The atmospheric environment over mainland China is divided into four zones,  
based on sensitivities. The S values of various zones are a geometrical series;  
for an increase of one unit in sensitivity, the mean pollution area approximately  
doubles. Centered in the Sichuan Basin, the various zones are in a stepwise  
distribution. Two figures show the pollution areas of surface sources, and zones  
of sensitivity on the atmospheric environment over mainland China. Two tables  
show the annual mean frequencies of stabilities of China's zones, and the  
correlation between sensitivity and S value.

## ENVIRONMENTAL QUALITY

### POLLUTION IN CHINA'S OFFSHORE WATERS STUDIED

Beijing ZHONGGUO HUANJING KEXUE /ENVIRONMENTAL SCIENCES IN CHINA/ in Chinese  
No 3, 21 Jun 84 pp 71-75

/Article by Shi E'hou /0670 6759 0186/, Han Jiangao /7281 6015 7559/, Huang Shuiguang /7806 3055 0342/ and Wu Chengbin /0702 2052 2430/ of Marine Environment Protection Institute, State Oceanography Bureau: "Seawater Pollution on the Offshore of China/

/Summary/ Beginning in 1972, pollution monitoring of offshore waters and pollution source investigation in coastal regions were conducted.

Rivers are the major carrier of pollutants into seas, with oil ranking first among pollutants. In the Bo Hai, the major pollutant is oil; in the East China Sea, the major pollutants are oil, mercury and organic matter; and in the South China Sea, the major pollutants are cadmium and lead. Especially serious is oil pollution in China's offshore waters in the East China Sea and Bo Hai. Higher concentrations of mercury, cadmium and lead have been measured in the northern Liaodong Bay, the Yalu and Zhu Jiang estuaries. Pollution of organic matter in China's offshore seawater is increasing from south to north.

Seven tables show the proportions of sewage emptied into the Bo Hai and Yellow Sea; detection of oil in the waters of China's coastal seas, oil concentration statistics in the Bo Hai, Yellow Sea, East China Sea and South China Sea, as well as detection of mercury pollution in the waters of China's coastal seas. Two tables show the distribution of oil concentration in waters of China's coastal seas, as well as the distribution of cadmium concentrations in the waters of South China Sea.

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CSO: 4009/13

## ENVIRONMENTAL QUALITY

### HEAVY METAL DISTRIBUTION, POLLUTION IN SEDIMENTS OF LAKE SONGHUA

Beijing ZHONGGUO HUANJING KEXUE /ENVIRONMENTAL SCIENCES IN CHINA/ in Chinese  
No 3, 21 Jun 84 pp 76-79

/Article by She Zhongsheng /0152 0022 4141/, Meng Xianxi /1322 2009 3886/,  
Yu Muqing /0205 4476 3237/, Liu Guiqin /0491 2710 3830/, Wang Qichao /3769  
6386 6389/ and Qi Shaohua /7871 1421 5478/ of Changchun Geography Institute,  
Chinese Academy of Sciences: "Study on the Heavy Metals Distribution and  
Pollution in Sediments of Lake Songhua and Rivers Inflow Into It"/

/Summary/ Lake Songhua is the Fengman Water Reservoir, providing benefits of  
fish breeding, power generation, irrigation, navigation and tourism in Jilin  
province. A 1980 study on heavy metals distribution, background content,  
pollution and source of pollutants of the lake area provided data for writing  
the paper.

Owing to industrial effluent, this body of water has been polluted to a certain  
extent, especially pollution of Hg, Cu, Cd, Cr and Ni in sediment. Restrictions  
imposed on industries are needed to prevent them from discharging waste water  
and refuse into the lake and tributary rivers, especially in the lower streams.  
Sand accumulation in the lake region caused by surface runoff is as high as  
300 million tons per year; every year, the average silt covering on the lake  
floor is about 0.5 to 1 cm, thus covering over the pollutants.

Three tables show the heavy metals content in sediments and soils in Lake  
Songhua; no reported pollution in tributary rivers and Lake Changbai; heavy  
metals pollution in sediments of Lake Songhua and tributary rivers; and compari-  
son of sediment pollution between Lake Songhua and other lakes. One figure  
shows the distribution of sampling sites.

The authors express their gratitude to Fu Yingjiang /0102 5391 3068/, Lu Yinfan  
/7773 5593 5400/ and Zhang Gaizhi /1728 5556 2535/ of the Jilin Environmental  
Protection Institute, and Guo Qili /6753 0796 4539/ of the Jilin Provincial  
Environmental Protection and Monitoring Station for assisting in sample  
collection.

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## ENVIRONMENTAL QUALITY

### ARSENIC BACKGROUND VALUES, DISTRIBUTION IN BEIJING'S SOILS, CROPS

Beijing ZHONGGUO HUANJING KEXUE /ENVIRONMENTAL SCIENCES IN CHINA/ in Chinese  
No 3, 21 Jun 84 pp 54-58

/Article by He Jianqun /6320 1696 5028/ of the Environmental Science Research Institute, Beijing Normal University: "Background of Arsenic and Its Distribution in Agricultural Soils and Crops in Beijing"/

/Summary/ In addition to arsenic background values and its distribution in Beijing's soils and crops, the relationship with soil-forming factors, physico-chemical properties of soil, and arsenic content in crops are reported. Preliminarily, it is concluded that the total arsenic background values of Beijing's soils have an apparent relationship with the mother rock of soil and the organic matter content when the pH is nearly neutral to slightly alkaline, but no significant relationship to soil types. However, different soil types and varying soil properties (such as presence of typical elements, pH and Eh values) caused by the soil-forming factors affect significantly variations in background values of available arsenic in the Beijing area. This variation plays a key role in studying migration, conversion and accumulation of arsenic, as well as in controlling and treating arsenic pollution.

Six tables show total and available arsenic background values in Beijing's agricultural soils, arsenic background values in Beijing's crops, arsenic content in brown soil developed from different types of mother rock, relationship between clay content and arsenic values in brown soil profile, and relationship between geomorphological portions and available arsenic in soils. Four figures show the variation in arsenic content in different soil profiles, relationship between total arsenic and available arsenic in grassy turf soil, relationship between pH and available arsenic in soil, and relationship between available arsenic values in grassy turf soil and arsenic content in paddy rice and wheat grains grown on grassy turf soil.

The author expresses his gratitude to nine cooperative units, including the Beijing Municipal Agricultural and Forestry Institute, and Beijing Agricultural University; to colleague Zheng Xinsheng /6774 2450 3932/ for selecting sites and collecting samples; and to Xu Jialin /6079 0857 3829/ and Yang Jurong /2799 1446 2837/ for evaluating the paper.

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CSO: 4009/13

## ENVIRONMENTAL QUALITY

### AUTOMATIC COLORIMETRIC MICRO-DETERMINATION OF URANIUM IN WASTEWATER

Beijing YOU KUANG YE /URANIUM MINING AND METALLURGY/ in Chinese No 1, 20 Feb 84  
pp 31-36

/Article by Zhang Hao /1728 3185/, Gao Li /7559 4539/, Huang Zongliang /7806 1350 4539/ and Guan Duoyuan /7070 1122 0955/: "Automatic Colorimetric Micro-determination of Uranium in Wastewater"

/Summary/ Micro-determination of uranium in water could be accomplished colorimetrically by using polyglycol-octyl-phenyl ester (OP) as an emulsifier to allow the formation of a water soluble complex between  $UO_2^{2+}$  and Br - PADAP. In this work, an automatic colorimetric testing apparatus was developed. Both manual and automatic colorimetric tests were carried out with natural and waste water samples to determine the operating conditions for such analyses. The effect of solution pH, reaction temperature, coexisting ions, sampling time, and rinsing time were investigated. The results of manual and automatic tests were found to be in good agreement. The detection limits of uranium were found to be in the 0.03-1mg/liter range. The relative standard deviation was  $\leq \pm 10$  percent and the uranium recovery was 92-108 percent. It was capable of analyzing 30 specimens per hour.

12553

CSO: 4009/3

## ENVIRONMENTAL QUALITY

### USE OF VENTILATION PRESSURE TO CONTROL RADON POLLUTION

Beijing YOU KUANG YE /URANIUM MINING AND METALLURGY/ in Chinese No 1, 20 Feb 84  
pp 56-59

/Article by Zhang Zhe /1728 0772/ of the Uranium Mining Research Institute:  
"Utilizing Ventilation Pressure to Control Radon Pollution in Uranium Mine"/

/Summary/ Radon pollution in uranium mines could be controlled by ventilation pressure. This method has been successfully applied to existing mines and four specific examples were given in this paper. The fundamental basis of this pollution control technique is the permeation and transport theory of radon in porous media. It was used to interpret the simple one-dimensional case. The appropriate ventilation pressure distribution may reduce radon permeation. Radon is not sealed in a specific location and is exhausted via various duck-work. Moreover, the operating cost and capital investment are also substantially less than those of other methods. This method, although very successful in existing mines, has not yet been included in the design of new mines. In addition, because of the complexity of the geological and hydrological conditions of mines, the theory of radon control by ventilation pressure must still be further studied.

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CSO: 4009/3

## ENVIRONMENTAL QUALITY

### BRIEFS

SICHUAN AFFORESTATION--As of 10 October the province has afforested more than 2.2 million mu since the beginning of all, a quadrupling over the same period last year. More than 290 million trees have been planted on the "four sides" and more than 7,400 mu of saplings have been raised. [Summary] [Chengdu SICHUAN RIBAO in Chinese 16 Oct 84 p 1]

IMPROVEMENT IN ENVIRONMENTAL MONITORING--Environmental monitoring work began rather late in China, but it is developing rapidly. Beginning in the late 1970's various levels of monitoring organs were set up, and at present there are 1,100 monitoring stations and more than 17,000 monitoring personnel. This was revealed recently at the third national conference on environmental monitoring work held in Xining. According to statistics, every year monitoring stations throughout the country provide nearly 5 million datum points on air and water quality, and noise pollution. Through monitoring and assessment, they have issued over the last 3 years 211 national and regional reports and charts on environmental quality and these have provided a scientific reference for formulating environmental protection laws and national economic construction measures. This conference was sponsored by the environmental protection bureau of the Ministry of Urban and Rural Construction and Environmental Protection. [Excerpt] [Beijing GUANGMING RIBAO in Chinese 12 Nov 84 p 2]

CSO: 4008/134

## Oceanography

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TITLE: "A Solution for Stream Function Representation of Nonlinear Ocean Waves"

SOURCE: Beijing HAIYANG HU HUZHAO /OCEANOLOGIA ET LIMNOLOGIA SINICA/ in  
Chinese No 2, Mar 84 pp 146-155

ABSTRACT: This paper presents a solution of the stream function representation for nonlinear ocean waves with a CYBER 170/720 computer. The given property is: because there is no  $C/2g$  term ( $C$  = wavelength  $L$ /period  $T$ ) in the dynamic free surface boundary condition,  $Q$ , the mean value of Bernoulli constant in a wave period, is limited to a small range and is selected easily. The initial values of parameters  $L$  (wavelength), (stream function at free surface) and  $X(n)$  (a coefficient to be determined) in the solution are found from the physical meaning, so the divergence in calculation, which may occur due to improper initial values of these parameters, can be avoided.  $Q$  is referred to as a variable which varies with the wave height in iteration, not spread out perturbably as  $Q$ .

Four figures show the coordinates of the wave motion system, order of stream function in ocean wave theory, comparison of profiles between a fifth order stream-function wave and a fifth order Stokes wave, and theoretical adaptation ranges of various ocean waves. Two tables show calculation results of profiles of the fifth order waves, and wave forces acting on a vertical cylinder.

The authors express their gratitude to professor Zhou Heng /0719 1854/ for his counsel, and to professor Wen Shengchang /2429 5110 1603/, associate professor Liu Yingzhong /0491 2019 0022/ and colleague Li Lei /2621 4320/ for their valuable opinions. The paper was received for publication on 22 October 1982.

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CSO: 4009/5



## Oceanography

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TITLE: "Preliminary Study of Ocean Wave Spectrum in Shallow Waters"

SOURCE: Beijing HAIYANG XUEBAO /ACTA OCEANOLOGICA SINICA/ in Chinese No 2,  
Mar 84 pp 143-150

ABSTRACT: Based on the principle of similar spectrum shape and parametric method, this paper relies on continuous recordings of ocean waves in shallow waters of the Bo Hai, Yellow Sea, the East and South China Seas. A spectrum mode of ocean waves in shallow waters was established, with the parameters of average slope height, average period, and relative depth. The magnitude of frequency index in the high frequency part in the mode is determined by the relative depths, in contrast to O. M. Phillips' derivation of the power of (-5). As proved by examining partial survey data, calculation results of the mode are in agreement with the survey values.

Four figures show high and low frequency portions of the spectrum, the relationship between the spectrum peak frequency and average frequency, and analysis of the spectrum mode in shallow waters.

The authors express their gratitude to Yang Keji /2799 0344 1142/ for writing a program and operating a computer for calculations, to Jiang Tailiang /1203 1132 5328/ and Tian Suzhen /3944 4790 3791/ for taking part in some of the study, to Zhang Haibo /1728 3189 3134/ for assisting the compilation of data, to assistant researcher Li Lei /2621 4320/ and colleague Wang Yimou /3769 0110 6180/ of the Oceanography Institute of the Chinese Academy of Sciences, and Zhang Dacuo /1728 1129 6934/ of the Shandong Oceanography College for suggestions, and to Xu Xiaowei /1776 1420 1792/ for making the drawings. The first draft was received on 23 August 1982; the revised draft was received for publication on 8 August 1983.

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CSO: 4009/6

Radiology

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Hangzhou

TITLE: "Natural Radionuclide Level of Building Materials in Zhejiang  
Province"

SOURCE: Beijing ZHONGHUA FANGSHE YIXUE YU FANGHU ZAZHI [CHINESE JOURNAL OF  
RADIOLOGICAL MEDICINE AND PROTECTION] in Chinese No 4, 25 Aug 84 pp 39-42, 80

TEXT OF ENGLISH ABSTRACT: This paper reports on the concentrations and  
relative radioactivity of  $^{226}\text{Ra}$ ,  $^{232}\text{Th}$  and  $^{40}\text{K}$  in 132 building material samples  
collected in Zhejiang Province. The results of 16 different types of finished  
building material products are compared.

The range of concentrations of the radium equivalent was found to be between  
0.5 pCi/g and 8.3 pCi/g in all finished building material products except coal  
cinder bricks. In addition, a few kinds of raw building materials with very  
high radioactivity, such as color glaze powder, phosphogypsum, iron powder  
and bauxite, were noticed. These materials seem to be the contributory factors  
toward the higher radionuclide level of finished products; therefore, the  
materials to be used in building should be selected and controlled beforehand.  
Also, the annual additional dose-equivalent to the human body caused by common  
building materials in Zhejiang was estimated according to their radioactivity  
levels.

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CSO: 4009/42

END